

# Marine Mammal Observer Report



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## REVISION SUMMARY

Rev	Date	Section(s)	Detail of Change
00	30/08/2023	All	For Issue to client
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## EXECUTIVE SUMMARY.

Sure Partners Ltd (SSE Renewables) commissioned Ground Investigation Ireland Ltd to perform Geotechnical Site Investigation operations within the offshore limits of the Arklow Bank Wind Park site using the vessel MV Connector between July and August 2023. The site investigation area is approximately 2.5 km East of Arklow Town, off the east coast of Ireland for the Arklow Bank Wind Park.

This report covers the Marine Mammal Observer and Passive Acoustic Monitoring mitigation undertaken during the Geotechnical Site Survey on the MV Connector from 06 July 2023 to 15 August 2023. The survey was performed at the Arklow Bank Wind Park.

The survey applied the *Marine Mammal Mitigation Plan* (RPS, 2020 & 2021).

A team of two dedicated Marine Mammal Observers (MMOs) and Passive Acoustic Monitoring operators (PAMOs) were present on board to implement mitigation measures as required over the 24-hour operational days. Visual or acoustic pre-start monitoring was implemented before the commencement of all the required operations:

- There were ten pre-start monitoring for Seismic-CPTs operations in total; three during daytime, one during dusk and five at night.
- There were thirty four pre-start monitoring for Vibro-corer operations in total, twenty two during daytime and twelve at night.

Visual monitoring was performed when operations were required and *Ad libitum* watches were taken during non-required operations resulting in a total of 323:42 hours of effort.

Due to a vertical configuration of the PAM system, acoustic monitoring was possible only when required by operations and resulted in a total of 29:32 hours of effort.

93.4% of the total monitoring effort took place while the acoustic source was not active, and 6.6% took place while active.

Weather conditions recorded during the survey consisted of chiefly southerly winds Beaufort force mainly 2 to 5, sea states *Slight* to *Choppy* predominating and low swell heights.

There were two (2) sightings and no acoustic detections of marine mammals.

During the survey, there were no incidences where survey operations were delayed due to the presence of marine mammals within the Mitigation Zone. There were no instances of non-compliance with the Marine Mammal Mitigation Plan during operations.

**Table 1-1: Summary of survey activities and mitigation during the geotechnical survey.**

<b>Project duration.</b>	6/07/2023 – 15/08/2023
<b>Total Visual Monitoring.</b>	323 hours and 42minutes
<b>Total Acoustic Monitoring.</b>	29 hours and 32 minutes
<b>No. of pre-start monitoring.</b>	44
<b>No. of sightings or detections during pre-start monitoring.</b>	0
<b>No. of delays due to marine mammals.</b>	0
<b>No. of incidents of non-compliance.</b>	0

## ABBREVIATIONS.

### Table of Abbreviations.

<b>Term</b>	<b>Definition</b>
<b>ABWP GI</b>	Arklow Bank Wind Park Geotechnical Investigation
<b>CPT</b>	Cone Penetration Test
<b>DP</b>	Dynamic Positioning
<b>ECR</b>	Export Cable Route
<b>EEZ</b>	Exclusive Economic Zone
<b>JIP</b>	Joint Industry Programme
<b>KoM</b>	Kick-off Meeting
<b>LA</b>	Lease Area
<b>LAT</b>	Lowest Astronomical Tide
<b>MMMP</b>	Marine Mammal Mitigation Plan
<b>MMO</b>	Marine Mammal Observer
<b>MMRA</b>	Marine Mammal Risk Assessment
<b>MZ</b>	Mitigation Zone
<b>NPWS</b>	National Parks and Wildlife Service
<b>NIS</b>	Natura Impact Statement
<b>PAMO</b>	Passive Acoustic Monitoring Operator
<b>SAC</b>	Special Area of Conservation
<b>SCPT</b>	Seismic Cone Penetration Test
<b>UTC</b>	Coordinated Universal Time
<b>Zoi</b>	Zone of Influence

# 1 INTRODUCTION.

## 1.1 PROJECT OVERVIEW.

This report details the procedures and results of marine mammal monitoring conducted during the Offshore Geotechnical Site Investigation in the area of Arklow Bank in the Irish Sea, East of Ireland waters. Geo Subsurface Expertise carried out this survey on behalf of Sure Partners Ltd on-board the MV Connector from 05 July to 15 August 2023.

The survey was run following the conditions described in Marine Mammal Mitigation Plan (RPS, 2020 & 2021), originally developed for the Marine Mammal Risk Assessment (RPS, 2020) and compiled within the Natura Impact Statement (RPS, 2021) which was approved by the Foreshore Licence FS007339 issued by Minister for Housing, Local Government and Heritage, Republic of Ireland and in line with the National Parks and Wildlife Service's Guidance to manage the risk to Marine Mammals from Man-made Sound Sources In Irish Waters (NPSW, 2014).

The purpose of this report is to outline the Arklow Bank Wind Park - Offshore Geotechnical Site Investigation 2023 adherence to the measures described in MMMP.

## 1.2 LEGISLATIVE BACKGROUND.

The waters of Ireland's Exclusive Economic Zone (EEZ) represent one of the most important cetacean habitats in Europe. At least twenty six species of marine mammal are known to occur in Irish waters. In total, twenty four species of cetacean (whales, dolphins and porpoises) have been recorded, eighteen of which are more commonly observed, while the remaining six species have rarely been recorded and are currently classed as vagrant. All cetacean species in Irish waters are protected by the Wildlife Acts 1976 to 2018 and Irish waters, including the entire EEZ were declared a Whale and Dolphin Sanctuary in 1991. All cetacean species are protected under Annex IV of the EU Habitats Directive (92/43/EEC), while harbour porpoise and bottlenose dolphin are also listed under Annex II of the Directive requiring the designation of Special Areas of Conservation (SACs) for their protection. Two species of seal (common seal and grey seal) breed in Ireland and are also listed under Annex II of the Directive and have SACs designated for their protection.

Anthropogenic underwater noise has the potential to disturb, displace, injure, or even kill marine mammals (Southall, 2007). Since August 2007, there has been a requirement for all drilling, piling, dredging, blasting, seismic, multibeam, side-scan sonar and sub-bottom profiling operations in the Irish EEZ to adhere to guidelines to protect marine mammals from man-made sound. This was first outlined in the Code of Practice for the Protection of Marine Mammals during Acoustic Seafloor Surveys in Irish Waters (2007). This has since been superseded by The Guidance to Manage Risk to Marine Mammals from Man-made Sound Sources in Irish Waters (2014). The guidance requires that qualified and experienced Marine Mammal Observers (MMOs) must be present on board all vessels conducting the listed activities at all times throughout the survey and that a pre-start monitoring and soft start protocol be adhered to.

## 1.3 SURVEY AREA

The Arklow Bank Wind Park is located approximately in a shallow water sandbank in the Irish Sea, 6 - 13km off the north Wicklow coast. The Foreshore Licence application area includes the Arklow Bank Wind Park and the cable route areas. The total area covers 130km<sup>2</sup> (13039 ha).

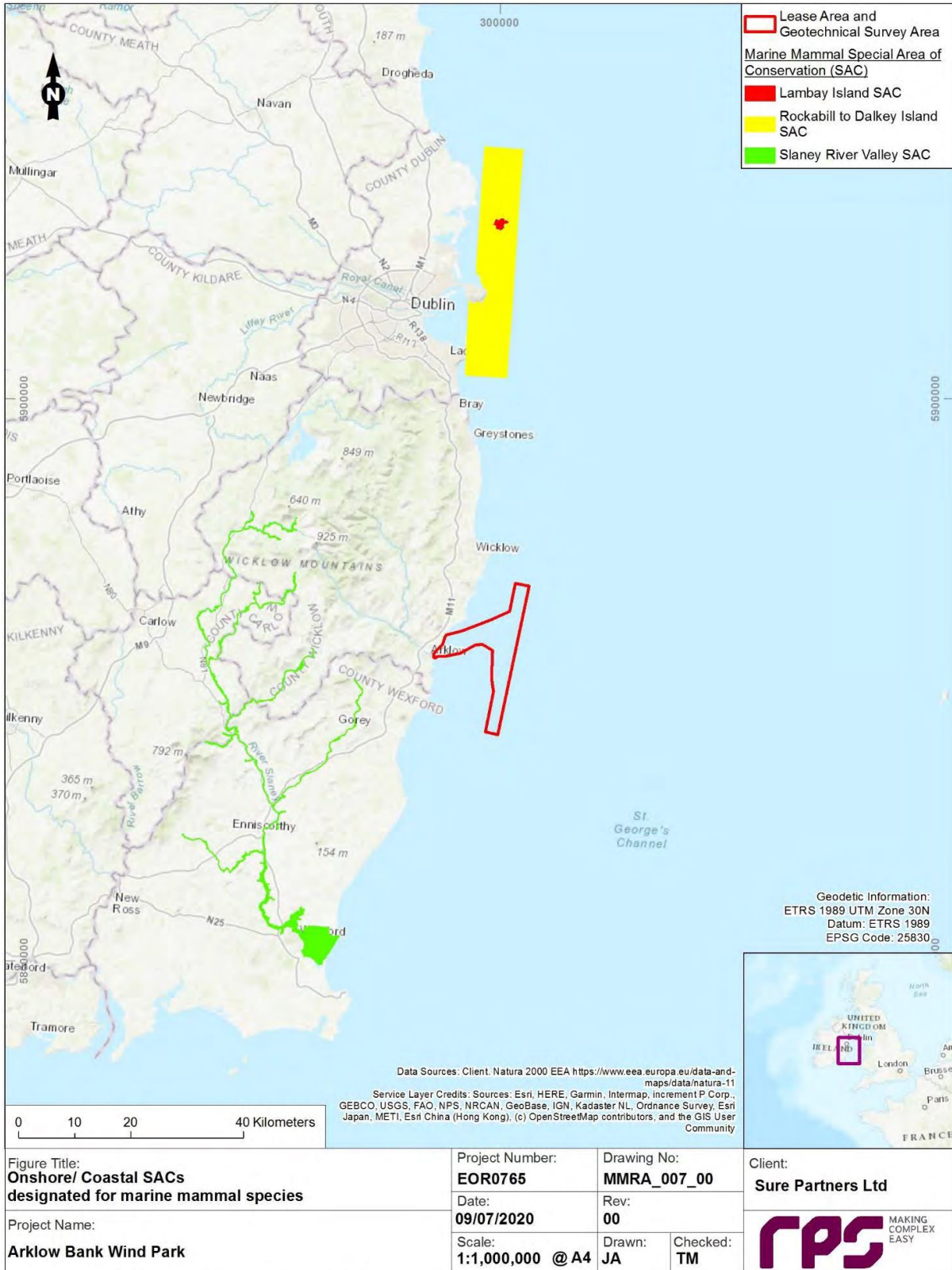
The part of the Irish Sea where the Arklow Bank Wind Park project is located has a relatively complex morphology consisting of banks, sediment waves and channels. The bathymetry in the application area ranges from 0-52m water depths.

All geotechnical site investigation activities were kept within the proposed license boundary.

Details of three closets SACs to Arklow Wind Park are listed in the table below.

**Table 1-1: Closets SACs to Arklow Wind Park**

<b>Special Areas of Conservation.</b>	
<b>Rockabill to Dalkey Island.</b>	Located approximately 37 km to the north of the Arklow Bank Wind Park. Extended southwards, in a strip approximately 7 km wide and 40 km in length.
<b>Lambay Island.</b>	Lies approximately 63 km to the north of the Arklow Bank Wind Park and is within the boundaries of the Rockabill to Dalkey Island SAC.
<b>Slaney River Valley.</b>	Located 45 km from the Arklow Bank Wind Park.



**Figure 1-1: SACs with Annex II species as qualifying interests in the Irish Sea. (Source: MMRA, RPS 2020).**

Of the twenty-five species, five of them are most likely to occur in the geotechnical survey area, five toothed whales and one baleen whale and two species of seals listed in the tables below.

**Table 1-2: Cetaceans most likely to be present in ABWP**

Cetacean Species	EC Habitat Directive
Harbour porpoise ( <i>Phocoena phocoena</i> )	Annex II & IV
Risso's dolphin ( <i>Grampus griseus</i> )	Annex IV
Bottlenose dolphin ( <i>Tursiops truncatus</i> )	Annex II & IV
Short-beaked common dolphin ( <i>Delphinus delphis</i> )	Annex IV
Minke whale ( <i>Balaenoptera acutorostrata</i> )	Annex IV

**Table 1-3: Seals most likely to be present in ABWP.**

Seal Species	Habitat Directive
Grey seal ( <i>Halichoerus grypus</i> )	Annex II
Harbour seal ( <i>Phoca vitulina</i> )	Annex IV

## 2 VESSEL AND SURVEY EQUIPMENT

### 2.1 VESSEL SUMMARY

The Geotechnical Site Investigation work was completed on board the MV Connector (Summary details in can be found in the table below).

**Table 2-1: Summary of vessel specifications for the MV Connector.**

General Information		Dimensions	
Vessel Name	MV Connector	Length (m)	90.2
Call Sign	OYOJ2	Breadth (m)	19
MMSI	219166000	Draft (m)	5.6
IMO	9244568	GRT	3524
Flag	Denmark (DK)	Accommodation	20 Berths
Class	Offshore Supply Ship	Deck Space (m <sup>2</sup> )	70
Built	2002	Endurance (Survey)	15 days



**Figure 2-1: Survey vessel, MV Connector**

### 2.2 SURVEY EQUIPMENT

The equipment used in the survey is listed below. Information on the survey equipment in tables and figures were taken from system specifications supplied by *Geo Subsurface Expertise*.

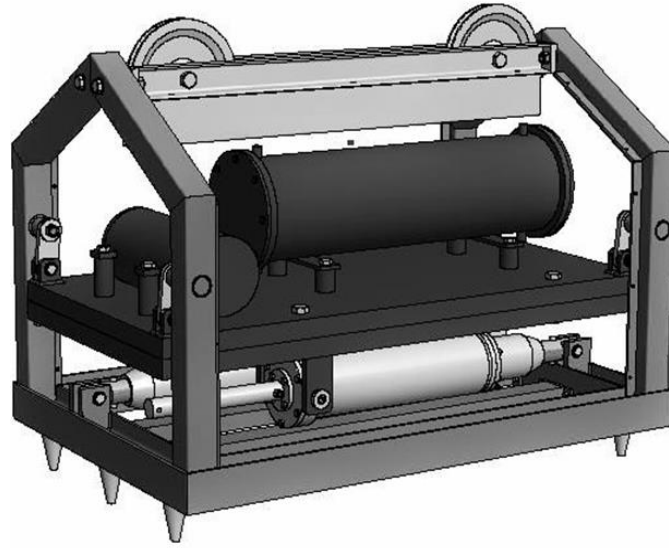
- Shear Wave Generator for Seismic Seabed CPT, *Geo Thor*.
- Combined Seabed rig for CPT and Vibrocore, *GeoCeptor*.

Potential impacts of noise from these systems on cetaceans vary depending on the following: the sound's propagation characteristics in the environment into which it is introduced, its intensity, frequency, duration, and distance from an animal.

**Table 2-2: Specifications summary of Geo Thor unit**

<b>Geo Thor Data*</b>	
<b>Manufacture</b>	Geo.
<b>Dimensions, L/W/H (m)</b>	1.50/1.00/1.50 (hammer unit). 6.06/2.44/2.60 (Launch frame as 20' container frame).
<b>Weight in air (Kg)</b>	1600.
<b>Weight in water (Kg)</b>	1300.
<b>Subsea power system</b>	Electro powered hydraulic.
<b>Hammer system</b>	Spring loaded pistons for left/right strokes.
<b>Stroke energy (Joule)</b>	Configurable 10 – 400.
<b>Maximum operational water depth (m)</b>	100.
<b>Stroke rate (hits/min)</b>	3.
<b>Distance, Center hammer – Center CPT (m)</b>	2 – 5 (Depending on onboard equipment setup).
<b>Hydraulic oil type</b>	Hydro 32.
<b>Deck space requirements (m2)</b>	15

\* Geo takes reservations for technical changes



**Figure 2-2: Shear Wave Generator for Seismic Seabed CPT, Geo Thor.**

**Table 2-3: Specifications summary of GeoCeptor unit.**

<b>Manufacture</b>	Geo	
<b>Dimensions, L/W/H (m)</b>	3.2/2.4/2.2 (w. tower 8.2 m)	
<b>Weight in air (Kg)</b>	10.700 – 14.400	
<b>Weight in water (Kg)</b>	7.900 – 13.300	
<b>Hydraulic oil type</b>	Texaco Hydra 32	
<b>Launch options</b>	“over the side”, platform or through the moon pool	
<b>Deck space requirements</b>	Approx. 55 m including containers	
<b>Maximum operational water depth (m)</b>	3000 (Current operational limit 550 m)	
<b>Max operational seabed inclination (°)</b>	10	
<b>Power requirements</b>	<b>Rig</b>	690 VAC, 33 kW, supplied from 400 – 440 V
	<b>Operation container</b>	400 VAC/60 Hz or 380V AC/50 Hz, 40kW
		240 VAC, 5 kW
	<b>Storage/Workshop</b>	240 VAC, 5 kW
<b>Lifting system</b>	Single wire (optional double acting wire)	
<b>Umbilical</b>	Tension winch mounted MacArthney 58825 for 550 meters water depth	
<b>GeoCeptor – Vibrocore unit data</b>		
<b>Vibrocore system</b>	GeoCorer 3000/6000 w. 3 kN impulse at 28 Hz for fast penetration	
<b>Core dimension (mm)</b>	106	
<b>Core catcher</b>	3 types of metal lamellae	
<b>Vacuum system</b>	Vacuum valve	



**Figure 2-3: Combined Seabed rig for CPT and Vibrocore, GeoCeptor.**

## 3 MITIGATION REQUIREMENTS

### 3.1 MITIGATION REQUIREMENTS SUMMARY

The mitigation measures to minimise the impact of man-made sounds on marine mammals, described in the Natura Impact Statement and outlined in Marine Mammal Mitigation Plan (RPS 2020 & 2021), have been implemented throughout the survey. The table below summarises the mitigation requirements.

**Table 3-1: MMMP requirements summary for ABWP GI 2023.**

Mitigation Requirements Summary	
Mitigation team and rota.	- Two qualified and experienced MMOs also experienced in the use of PAM.
	- 24-hours operations coverage of MZ. Visual monitoring during daylight hours/good visibility and acoustic monitoring during darkness or low visibility.
Pre-start monitoring.	- Monitoring MZ 30 minutes before the start of geotechnical activities.
	- Delay of commencement of survey operations if marine mammals are detected within MZ during pre-start monitoring.
Breaks in sound output.	- During seismic CPT breaks of 5-10 minutes and vibro-corers breaks of 30 minutes, MZ is to be checked by MMO/PAM.
	- If marine mammals are detected during breaks, 30 minutes of pre-start monitoring is required.
	- Breaks greater than 5-10 minutes for Seismic CPT and greater than 30 minutes for vibro-corer, 30 minutes of pre-start monitoring is required.
Mitigation Zone (MZ).	200m radial distance from the sound source.

### 3.2 MITIGATION PROCEDURES

The MMMP (RPS, 2020 & 2021), which was developed in line with the latest NPWS Guidance to manage the risk to marine mammals from man-made sound sources in Irish waters (NPWS, 2014), was applied during survey operations. The mitigation focussed only on those activities which produce a measurable sound, namely: seismic CPT and vibro-coring. For other geotechnical activities (push-CPT) there were no measures implemented.

#### 3.2.1 MITIGATION TEAM

Two qualified and experienced Marine Mammal Observers (MMOs) who are also experienced in the use of passive acoustic monitoring (PAM) were on-board the Connector for the duration of the project working 12 hours each, back to back in opposite shifts, giving advice to operators regarding the implementation of mitigation procedures, monitoring the adherence of the survey operations to MMMP, acting as a consultant to the client, carrying out visual or acoustic pre-start monitoring, collecting and logging all the relevant data and reporting the MMO/PAM and survey activities as

required. MMO/PAM on shift attended Daily Meetings, Kick-off Meeting presentations, safety talks and drills on board, as well.

**Table 3-2: Mitigation Team Details**

Name	Shift
Mark Bird	22:00 - 10:00 (1 <sup>st</sup> rotation)
Manuel Garcia	10:00-22:00 (1 <sup>st</sup> rotation)
	7:00 - 19:00 (2 <sup>nd</sup> rotation)
Penha Carreta	19:00 - 7:00 (2 <sup>nd</sup> rotation)

### 3.2.2 PRE- START MONITORING

At least 30 minutes of pre-start monitoring of the MZ was undertaken before any of the measurable sound sources were activated. MMO/PAMO was informed in advance about survey operations scheduled on daily basis and for each shift.

- For Seismic CPT operations, MMO/PAM was informed at least 45 minutes of the intention of commence the survey operations. Once the survey equipment was ready for data acquisition, MMO/PAM was called by the operator for clearance before to be activated and the monitoring (visual or acoustic) was maintained at least until the survey operation was concluded and the sound source was back on-board.
- Vibro-corer operations were executed sequentially in consecutive series of sampling stations. During daylight hours and good visual conditions, at the beginning of a cycle of sampling series; MMO was informed at least 45 minutes of the intention of commence the survey operations, once the survey equipment was ready to start sampling, MMO was called by the operator for clearance each time before to be activated and the visual monitoring was maintained until one of the sampling-stations series was completed, allowing time enough for suitable breaks on watches when push-CPTs, down time for weather/high currents or equipment maintenance took place.

Due to the vertical configuration of the PAM system, during dark hours/bad visibility, PAMO was informed at least 45 minutes of the intention to commence the survey operations, when the vessel was in DP on location hydrophone cable was deployed, Once the survey equipment was ready to start sampling, PAMO was called by survey operator for clearance before to be activated and the acoustic monitoring was maintained until the sound source was deactivated, and hydrophone cable was retrieved.

### 3.2.3 VISUAL MONITORING

Combined use of the naked eye and binoculars was used to monitor the sea surface visually. The distance was estimated using reticulate binoculars. MMO/PAM effort, sightings, and operation data of survey activity was recorded following Joint Industry Programme (JIP) 22 spreadsheets template

forms available from the NPWS website (Appendix 1) to monitor compliance with the foreshore licence, MMMP and the NPWS guidelines.

- Observation platform was located on the bridge and bridge wings, which allowed 360 degrees of visibility at 14 m elevation above sea level, and where the MMO station was located, as well.
- Visual conditions during pre-start monitoring were undertaken during daylight hours with visibility extended at least 1km beyond the limits of MZ and with WMO Sea State 4 or less.
- MMO Equipment described in the table below.

**Table 3-3: MMO Equipment**

MMO Equipment	
Binoculars	ESS LNB 7x50mm with reticule and compass.
	Bushnell Marine7x50 mm with reticule and compass.
Cameras	Canon Rebel T6 (Lens 70-300mm).
	Olympus E-510 (Lens 40-150 mm 1:4-5.6).

### 3.2.4 ACOUSTIC MONITORING

PAM equipment (including backup spares of the key components), was provided to the survey by Vanishing Point Marine UK, via GDGeo Ltd (Cork, Ireland). The PAM kit consisted of a 2x hydrophone array, with a connected tow cable, a length of 80m, a deck cable of 30m, a signal conditioning unit (buffer box), an analogue to digital data processing equipment, and a laptop computer.

The PAM desk/station (Figure 3-1) was set up, within the MV Connectors client’s operations office, close to Geo Ops also located mid-rear, at the back deck of the vessel.

The analogue to digital data processing equipment comprised an amplifier/conditioner unit, (buffer box), Acquisition SD Sail DAQ /Sound card, Behringer audio processing, and a power supply, all contained within a Vanishing Point field instrument case.

The deck lead is connected to the rear of a conditioning unit, with outputs to a laptop running PAMGuard version 2.01.05 (open-source passive acoustic monitoring software), for visualisation and detection.

The data model (PSF file, 11111.psf). within PAMguard was built up and made from scratch with relevance to this Project; it provided for a multi-frequency spectrogram display, click detector displays, with associated species, click classifications, namely for porpoises and dolphins, for "hint/" automatic display, and recording capacity.

Click detections are identified as including several regular repetitive clicks or “click trains” de-noted above background noise within similar, ‘recognised’ frequencies, which can then be further identified against known patterns, via a signature “Wigner plot”; this was an added module to the click display, without bearing information click detections are identified by click amplitude.

Marine mammal detections could be recorded using a sound recorder module added to the data model in PAMGuard, and any nighttime observations, saved, and played back (“PAM Recordings” file), for further analysis.



**Figure 3-1: PAM Station**

In the event of an acoustic detection, collected screenshots of the PAMGuard displays could also be made. PAMguard Settings were adjusted during the survey, to optimise the system performance.

PAM deployment. PAM pre-work searches were conducted when conditions were unsuitable for visual pre-work searches, or more specifically nighttime operations, before activation of the "THOR HAMMER" sound source, when seismic CPT site Ops were undertaken.

The deck cable,(total length of 30m) was run in a safe protocol, from inside the client cabin, and connected to the tow /array cable on the outer cabin; stern deck side, and deployed from the vessels mid STWD qtr side, in a safe location away from the vessel's thrusters, and far enough away from GEO operations to not be a hindrance.

Due to the extremely shallow nature of the project, deployment depth was experimented with and settled on a depth of 10 metres. A "Chinese Finger" was attached to the tow cable, and attachment location, via shackle to a fixed anchor point on the vessel's STRB lower side, so the tow cable was taking strain from the vessel, via this attachment point, and not from the cable connector.

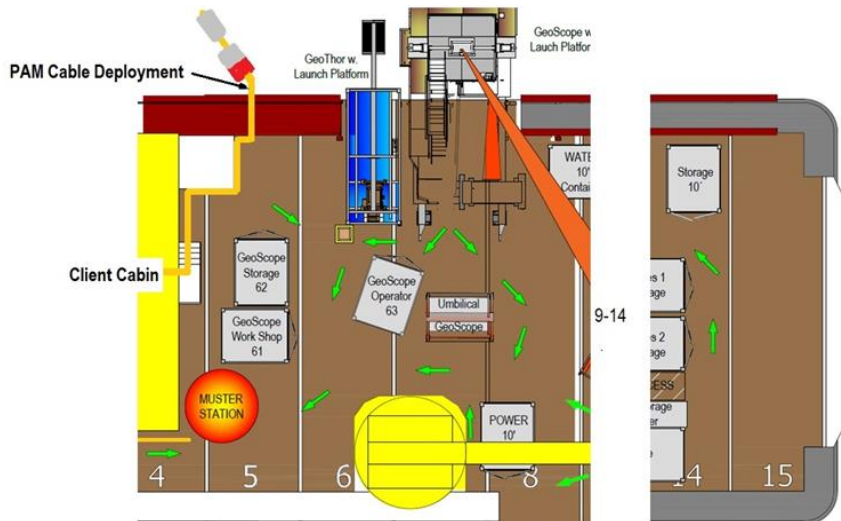
**The hydrophone array (as shown in the diagram belowFigure 3-2: Hydrophone Configuration**

) consisted of an oil filled tube section with two hydrophone elements spaced 30 cm apart, with a frequency response range from 2Khz-150Khz, mid-range independent 0 – 48kHz, a pre-attached 7kg weight, allowed for vertical PAM deployment during Seismic CPT, and for future Vibrocore Operations.



**Figure 3-2: Hydrophone Configuration**

Due to limited space, and operations procedures, (mainly pile test location vessel transits, and timings), the tow cable, (with attached hydrophone array cable), was deployed and re-deployed for each separate seismic CPT and vibro-corer operation. Once each pre-work site search/test had been conducted and completed, by the GEO Operations team, the cable was retrieved and stored away neatly for the following seich/test deployment.



**Figure 3-3: PAM cable deployment**

### 3.2.5 MITIGATION ZONE

The Mitigation Zone (MZ) is the body of water surrounding the noise source, within which the mitigation measures are implemented and which the observer monitors, visually or acoustically, for the presence of marine mammals before and during the survey operations.

The NPWS guidelines for minimising the risk of injury to marine mammals suggest mitigation distances should be informed by project-specific sound propagation modelling and agreed with the Regulatory Authority (MMP-RPS, 2021 and NPWS, 2014).

The underwater noise modelling assessment identified a maximum injury zone – across all activities and all species - of 62 m (based on cumulative exposure to noise as animals flee the area). The noise assessment has highlighted that noise arising from the survey vessels themselves is likely to cause marine mammals to move away from the injury zone. However, to implement best practice, a mitigation zone of 200 m is considered appropriate. This is more than twice the distance of the injury zone and within the range over which both visual and acoustic detections are effective (MMMP-RPS, 2021). A 200m Mitigation Zone was established accordingly with MMMP.

#### 3.2.5.1 DELAY IF MARINE MAMMALS DETECTED WITHIN MZ

Survey activities resulting in a measurable sound should not commence if marine mammals are detected within the mitigation zone (MZ) or until 30 minutes after the last visual detection has elapsed. If marine mammals are detected in the MZ the MMO should track the marine mammals detected and the animals had left the mitigation zone before any sound-producing activities commence.

No marine mammals were detected in the MZ prior to sound-producing activities commencing.

### **3.2.6 BREAK IN SOUND OUTPUT**

During seismic CPT if there is a break in sound output for a period of 5 - 10 minutes (e.g. due to equipment failure, shut-down, survey line or station change) the MMO/PAM Operator will be required to check that no marine mammals are observed within the monitored zone prior to recommencement of the sound sources at full power.

Where a marine mammal is observed within the 200 m search zone during such a break of 5 - 10 minutes, then all Pre-Start Monitoring shall recommence as in a normal start-up operation.

In any case, if there is a break in sound output for a period greater than 10 minutes then all Pre-Start Monitoring will be undertaken.

No breaks in sound emission occurred during Seismic CPT operations, visual and acoustic monitoring was performed as described in section 3.2.2. No marine mammals were detected during operations.

During vibro-coring if there is a break in sound output for a period of 30 minutes (e.g. due to equipment failure, shut-down, survey line or station change) the MMO/PAM Operator will be required to check that no marine mammals are observed within the monitored zone prior to recommencement of the sound sources at full power.

Where a marine mammal is observed within the 200 m search zone during such a break of 30 minutes, then all Pre-Start Monitoring shall recommence as in a normal start-up operation.

In any case, if there is a break in sound output for a period greater than 30 minutes then all Pre-Start Monitoring will be undertaken.

Visual and acoustic monitoring procedures during vibro-coring operations are described in section 3.2.2. No marine mammals were detected during operations.

### **3.2.7 COMMUNICATIONS**

The mitigation team were provided with a suitable UHF radio, a direct communication was established with survey operator (designated person). The survey operator called MMO/PAMO to start a pre-start monitoring, and clearance before starting survey operations and informed MMO/PAMO when the survey equipment started and finished as well. Exact timings of operations were provided by survey operators from their logs.

## 4 RESULTS AND DISCUSSION

### 4.1 GEOTECHNICAL SURVEY OPERATIONS

From the commencement of geotechnical survey operations on 06 July 2023 until completion of the last sampling station on 15 August 2023 a total number of 10 Seismic-CPT and 34 vibro-coring operations took place, total amount of time when sources were active are shown in the table below.

**Table 4-1: Sources activity times.**

<b>Seismic CPT operations</b>	
Total time active (hh: mm)	22:08
<b>Vibro-corer operations</b>	
Total time active (hh:mm: ss)	01:56:47

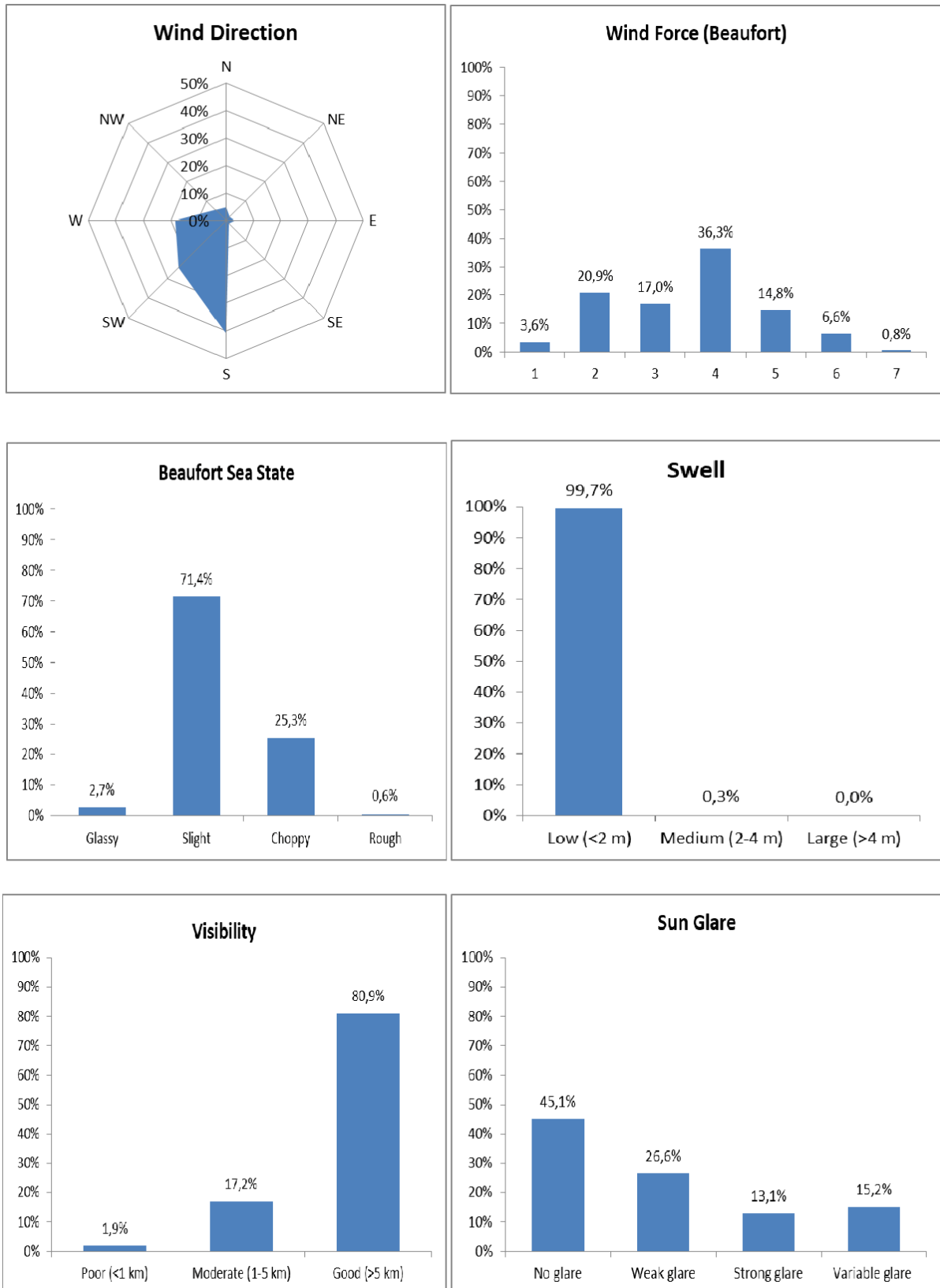
### 4.2 WEATHER CONDITIONS

Wind forces (Beaufort scale) 1 - 7 were seen throughout the monitoring effort with force 4 being the most frequently recorded followed by force 2, at 36.1% and 20.7% respectively. South and South West were the most frequent wind directions recorded throughout the monitoring effort, at 41.0% and 24.3% respectively. South winds of force 4 Beaufort scale were the most frequently recorded direction and force throughout the survey.

Sea state was recorded as slight 71.4% of the time with swell less than 2m in height 99.7% of the time.

Visibility was good (>5km) at 80.9%; moderate (1-5Km) at 17.2% and poor (<1km) 1.9% of the time with no sun glare for 45.1% and weak by 26.6% of the time, followed by 15.2% and 13.1% of the time variable and strong respectively.

A summary of weather conditions is shown in the figure below and full details of weather conditions can be found in the recording forms in Appendix 1.

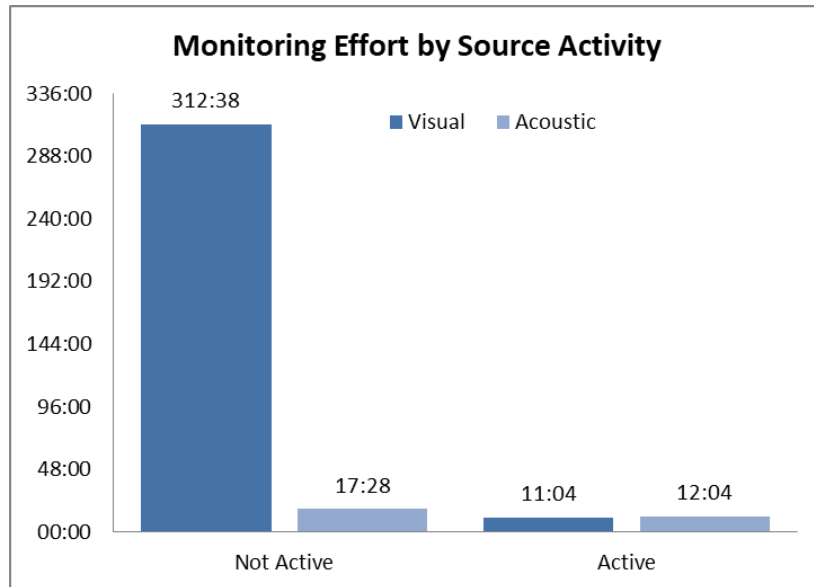


**Figure 4-1: Weather conditions throughout ABWP GI 2023**

### 4.3 VISUAL AND ACOUSTIC MONITORING EFFORT

A total of 323:42 hours of dedicated marine mammal watches were carried out by the MMO and 29:32 hours of dedicated marine mammal acoustic monitoring by the PAMO between 06 July 2023 and 15 August 2023.

Out of the total 353:14 hours of the monitoring effort, 23:08 hours (6,6%) were completed whilst the acoustic sources were active and 320:06 hours (93,4%) were completed whilst the acoustic sources were silent.



**Figure 4-2: Times of visual and acoustic monitoring effort by source activity**

From the first day of the Geotechnical Investigation on the 06 July 2023 until the 15 August 2023 when the project was completed, a total number of forty four dedicated Pre-Start Monitoring were conducted. There were twenty seven visual Pre-Start Monitoring during the day and seventeen acoustic Pre-Start Monitoring during the night. A total of forty four Pre-Start Monitoring was conducted in shallow waters (< 200 m) with 30 minutes duration each.

**Table 4-2: Summary of Marine Mammal Monitoring Effort.**

Marine Mammal Monitoring Effort Summary		
Monitoring Effort(hrs/min)	Total Visual Monitoring	323:42
	Total Acoustic Monitoring	29:32
	Total Monitoring Effort	353:14
Pre-Start Monitoring for Seismic CPT	Number Visual Pre-Start	5
	Number Acoustic Pre-Start	5
	Total Number of Pre-Start (SCPT)	10
Pre-Start Monitoring for Vibro-corer	Number Visual Pre-Start	22
	Number Acoustic Pre-Start	12
	Total Number of Pre-Start (VC)	34
Pre-Start Monitoring (Total)	Total Number of Pre-Start	44

#### 4.4 MARINE MAMMAL SIGHTINGS AND ACOUSTIC DETECTIONS

A total of two marine mammal sightings were recorded during MMO observations throughout the geotechnical site investigation.

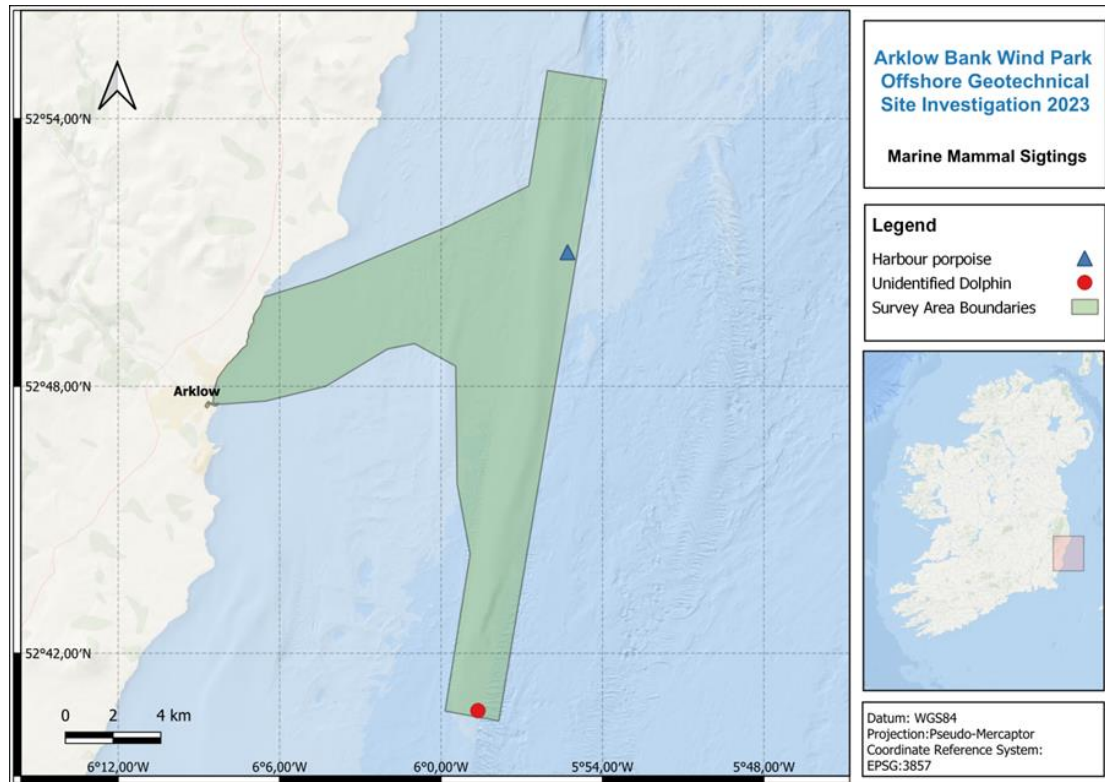
On 18/07/2023 at 15:28 (UTC) five individuals of an unidentified dolphin species (*Delphinidae sp.*) were spotted at 900m to the bow and approached the vessel at the closest distance of 450m, no mitigation action was required as push-CPT operations are not considered as a potential cause of injury or disturbance by MMMP and NPWS guidelines and the animals did not enter within the 200m MZ.

On 15/08/2023 at 17:22 (UTC) at least three individuals of harbour porpoise (*Phocoena phocoena*) were spotted for less than 1 minute, at 400m to the bow/starboard side travelling in opposite course when the vessel was in transit/approaching to the sampling station and the survey equipment was on-board.

A selection of the data collected during the sightings is shown in the table below and the location map in Figure 4-3, Full details of sightings, operations and MMO/PAM effort can be found in the NWSP-JIP recording forms in the Appendix.

**Table 4-3: Details of marine mammal sightings**

Sighting Number	Date	Species	Number	Range of Animal	Bearing to Animal	The direction of Travel (compass points)	Operation activity Y/N	Mitigation Action
1	18/07/2023	Unidentified dolphin species ( <i>Delphinidae sp.</i> )	5	900m	45	NW	N	None required
2	15/08/2023	Harbour porpoise ( <i>Phocoena phocoena</i> )	3	400m	35	SE	N	None required



**Figure 4-3: Marine Mammal sightings during ABWP GI Investigation (incidental sightings not included)**



**Figure 4-4: Unidentified dolphin species**

One incidental sighting was reported by the Client Representative on 10/08/2023 at 19:00 approx. (UTC) While the MMO was not on watch and no sound-producing sources were active, a video recorded showed two individuals of harbour porpoise (*Phocoena phocoena*) travelling away to the bow of the vessel at an approximate distance of 300m. There were no acoustic detections of marine mammals.

#### **4.5 MITIGATION ACTIONS**

No mitigation actions were required to be undertaken. No marine mammals were detected visually or acoustically during the 30 minutes of the pre-start monitoring before the start of any of the sound-producing sources, neither Seismic CPTs nor vibro-coring, within the 200m MZ. This resulted in no delays in the commencement of survey operations due to the presence of marine mammals.

#### **4.6 COMPLIANCE WITH MMMP**

For the entire duration of the ABWP GI, the survey crew diligently performed all mitigation requirements, and the procedures were in full compliance with the MMMP approved by the regulator.

- Two MMO/PAM operatives available to cover 24 hours survey operations.
- Each measurable sound-producing operation (seismic CPT and vibro-corer) is preceded by at least 30 minutes of dedicated pre-start monitoring of MZ (as described in section 3.2.2).
- No delays on commencement of survey operations were needed as no marine mammal was detected visually or acoustically during pre-start monitoring within the MZ.
- Breaks in sound outputs performed as outlined in section 3.2.7.

No instance of non-compliance with MMP was observed.

## 5 REFERENCES

Arklow Bank Wind Park Phase 2 Marine Site Investigations, revised Natura Impact Statement, SPL Document ref: LF100034-CST-OF-LIC-LIC-0003- ABWP Marine Site Investigation – Revised Natura Impact Statement, Version F01, RPS, October 2021.2

Foreshore Licence: FS007339 Sure Partners, Arklow Bank Wind Park Phase 2 Site Investigations, issued by Chief State Solicitor’s Office, Osmond House, Ship Street Little, Dublin 8; File ref.: 2022/01908, 23<sup>rd</sup> May 2022. Department of Housing, Local Government and Heritage.

Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters. National Parks and Wildlife Service; Department of Arts, Heritage and Gaeltacht, January 2014.

Marine Advisor’s Environmental Assessment and Determinations Report, Department of Housing, Local Government and Heritage, 25<sup>th</sup> of April 2022.

Marine Mammal Risk Assessment, Sure Partners Limited, Document Reference: LF100034-MIP-GT-SUR-ASS-001. Rev 00. RPS, 21<sup>st</sup> May 2020.

National Parks & Wildlife Service Recording Forms (template) , file name: 23140\_JIP\_MMO\_Forms\_NSWP.

RPS (2022). ARKLOW BANK WIND PARK Marine Mammal Risk Assessment for Geophysical Site Survey. Sure Partners Limited. Document Reference: LF100034-CST-EV-REP-ASS-0001

RPS (2021), Marine Mammal Mitigation Plan. Sure Partners Limited. Document Reference: LF100034-CST-OF-LIC-LIC-0003

Southall, B.L., Bowles, A.E., Ellison, W.T., Finneran, J.J., Gentry, R.L.,Greene, C.R., Kastak, D., Ketten, D.R., Miller, J.H., Nachtigall, P.E., Richardson, W.J., Thomas, J.A., and Tyack, P.L. (2007). Marine Mammal Noise Exposure Criteria: Initial Scientific Recommendations. Aquatic Mammals 33, 411 -497.

## APPENDICES

The following appendices have been issued as separate documents to this report:

Appendix 1 23140-GDG\_Arklow SI Offshore\_Appendix A-JIP\_MMO\_Forms\_NSWP

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